Alg. 2 Warm Up #2-4

Solve for y:

1) $7x + \frac{3}{4}y = 15 + x$

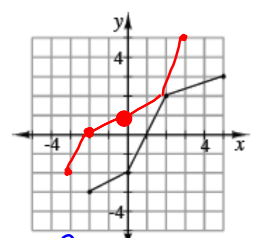
2) $x = (y - 4)^2 + 8$

3) Accurate to 2 decimal places:

$4^x = 78$

HW Questions:

5-33. The function $f(x)$ is represented in the graph at right. Draw a graph of its inverse function. Be sure to state the domain and range for both $f(x)$ and $f^{-1}(x)$.



$f^{-1}(x)$

$-3 \le x \le 3$

$-2 \le y \le 5$

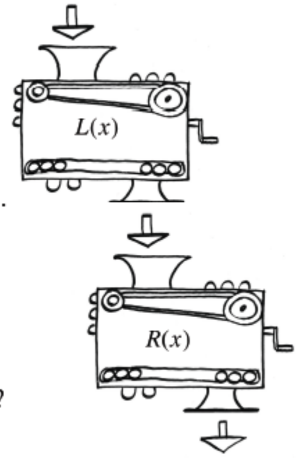
domain $f(x)$

$-2 \le x \le 5$

range:

$-3 \le y \le 3$

5-34. Lacey and Richens each have their own personal function machines. Lacey's machine, $L(x)$, squares the input and then subtracts one. Richens' function machine, $R(x)$, adds 2 to the input and then multiplies the result by three.



a. Write the equations that represent $L(x)$ and $R(x)$.

b. Lacey and Richens decide to connect their two machines, so that Lacey's output becomes Richens' input. If 3 is the initial input, what is the eventual output?

c. What if the order of the machines was changed? Would it change the output? Justify your answer.

$$L(x) = x^2 - 1$$

$$R(x) = 3(x+2)$$

5-35. Solve the system of equations at right.

$x - 2y = 7$

$6y - 3x = 33$

a. What happened? What does this mean?

b. What does the solution tell you about the graphs?

5-36. Dana's mother gave her $\boxed{\$175}$ on her sixteenth birthday. *"But you must put it in the bank and leave it there until your eighteenth birthday,"* she told Dana. Dana already had \$237.54 in her account, which pays 3.25% annual interest, compounded quarterly. If she adds her birthday money to the account, how much money will she have on her eighteenth birthday if she makes *no* withdrawals before then? Justify your answer.

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

A = Balance
P = Initial amount
r = interest rate (as a decimal)
n = number of times compounded in a yr.
t = time in years.

5-37. Multiply each expression below.

a. $(x+4)(x-14)$

b. $(2m+5)(2m-1)$

c. $(x-9)(x+9)$

d. $(3y+2)^2$

5-38. Calculate the x-intercepts for the graph of each function below.

a. $y=(x-2)(x+1)$

b. $y=2x^2+16x+30$

$0=(x-2)(x+1)$

$x=2,-1$

$\boxed{(2,0) \ \& \ (-1,0)}$

$0=2x^2+16x+30$

5-39. If $2^{x+4}=2^{3x-1}$, what is the value of x?

$x+4=3x-1$

If: $2^x=2^3$

$x=3$

$4^x=2^3$

$(2^2)^x=2^3$

$2^{2x}=2^3$

$2x=3$

$x=\frac{3}{2}$

Yesterday's CP's: 5 - # 19 ---> 23

5-20. Find the equation of the inverse of $y = (\frac{x}{2})^2$. Is there another way you could write it? If so, show how the two equations are the same. Justify that your inverse equation undoes the original function and use a graphing calculator to check the graphs.

Original

Input x

$\div\ 2$

Square it

Inverse $\longrightarrow$ Input x

$\pm\sqrt{\ }$

times 2

INVERSE

$$\boxed{\begin{cases} y = 2\sqrt{x} \\ y = -2\sqrt{x} \end{cases}}$$

★ Shortcut: Swap the x and y, then solve for y.

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$$y = \left(\frac{x}{2}\right)^2$$

Inverse:

Swap x & y: $\sqrt{x} = \sqrt{\left(\frac{y}{2}\right)^2}$

$2(\pm\sqrt{x}) = \frac{y}{2} \cdot 2$

$$\boxed{\begin{array}{l} y = 2\sqrt{x} \\ y = -2\sqrt{x} \end{array}}$$

Another example:

$$y = \frac{1}{3}x^2 - \frac{10}{3}x + 2 \longrightarrow$$

Swap x & y:

$x = \frac{1}{3}y^2 - \frac{10}{3}y + 2$

$3x = y^2 - 10y + 6$

$3x - 6 + 25 = y^2 - 10y + 25$

$3x + 19 = (y-5)^2$

$\pm\sqrt{3x+19} = y - 5$

Inverse: $\boxed{y = \pm\sqrt{3x+19} + 5}$

5-21. Consider your equation for the inverse of $y=(\frac{x}{2})^2$.

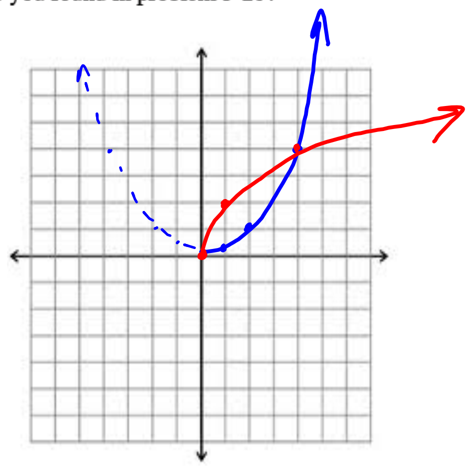
a. Is the inverse a function? How can you tell?

b. Use color to trace over the portion of your graph of $y=(\frac{x}{2})^2$ for which $x \geq 0$. Then use another color to trace the inverse of *only this part* of $y=(\frac{x}{2})^2$. Is the inverse of this part of $y=(\frac{x}{2})^2$ a function? ✓

c. Find an equation for the inverse of the restricted graph of $y=(\frac{x}{2})^2$. How is this equation different from the one you found in problem 5-20?

Domain
$x \geq 0$

Range of inverse
$y \geq 0$



5-22. Consider the function $f(x)=(x-3)^2$.

a. How could you restrict the domain of $f(x)$ so that its inverse will be a function? $x \geq 3$

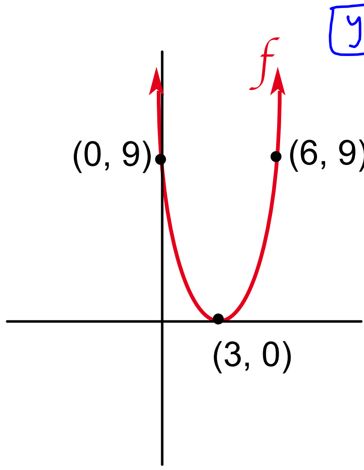
b. Graph $f(x)$ with its restricted domain and then graph its inverse on the same set of axes.

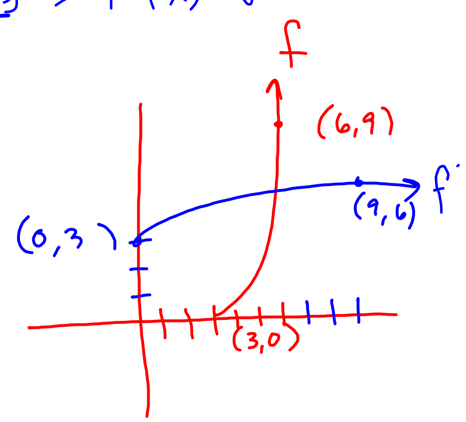
c. Find the equation of the inverse of $f(x)$ with its restricted domain.

Swap x & y → $x=(y-3)^2$

$\sqrt{x} = y-3$

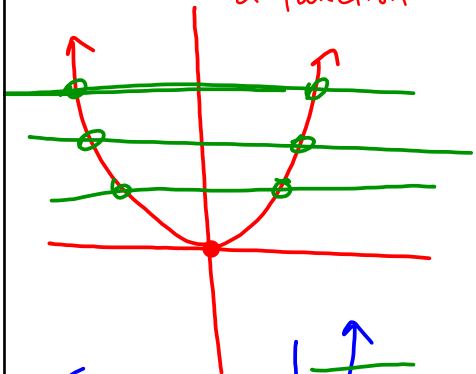
$\boxed{y=\sqrt{x}+3}$ → $f^{-1}(x)=\sqrt{x}+3$



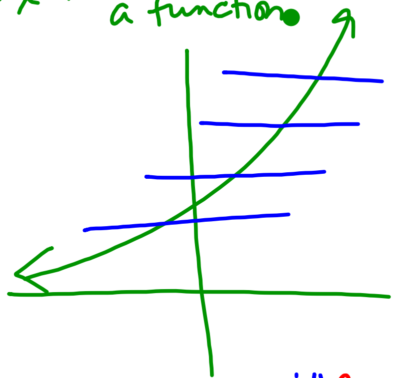


5-23. Is there a way to look at any graph to determine if its inverse will be a function? Explain. Find examples of other functions whose inverses are not functions.

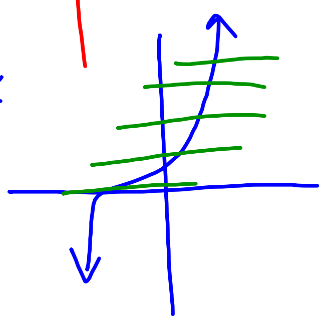
Ex: Inverse not a function



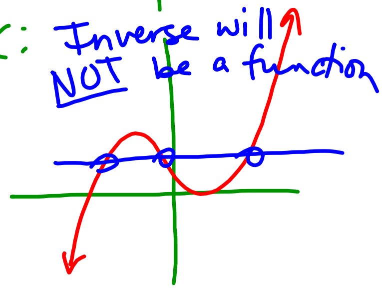
Ex: Inverse will be a function



Ex



Ex: Inverse will NOT be a function



CP's: 5 - # 40 ---> 44

5.1.3 What can I do with inverses?

Finding Inverses and Justifying Algebraically

In this chapter you first learned how to find an inverse by undoing a function, and then you learned how to find an inverse graphically. You and your team may also have developed other strategies. In this lesson you will determine how to find an inverse by putting these ideas together and rewriting the equation. You will also learn a new way to combine functions that you can use to decide whether they have an inverse relationship.

$y = mx + b$

5-40. Consider the table at right.

x	y
1	–5
3	7
5	19
7	31

-6 $+12$

a. Write an equation for the relationship represented in the table. $y = 6x - 11$

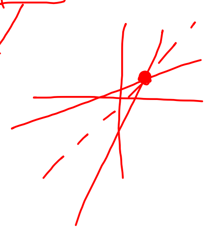
b. Make a table for the inverse.

c. How are these two tables related to each other?

d. Use the relationship between the tables to find a shortcut for changing the equation of the original function into its inverse. → Swap x & y

e. Now solve this new equation for y.

f. Justify that the equations are inverses of each other.



d) $x = 6y - 11$

e) $\frac{x + 11}{6} = \frac{6y}{6}$

$y = \frac{1}{6}x + \frac{11}{6}$

5-41. Find the inverse function of the following functions using your new algebraic method, clearly showing all your steps.

a. $y = 2(x-1)^3$

b. $y = \sqrt{x-2} + 3$

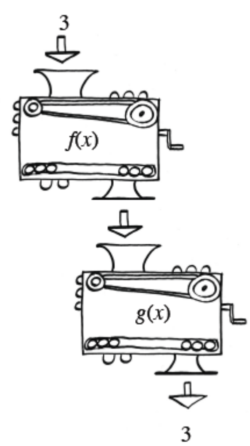
c. $y = 3\left(\frac{x-9}{2}\right) + 20$

d. $y = \frac{4}{3}(x-1)^3 + 6$

5-42. Adriena's strategy for checking that the functions $f(x)$ and $g(x)$ are inverses is to think of them as stacked function machines. She starts by choosing an input to drop into $f(x)$. Then she drops the output from $f(x)$ into $g(x)$. If she gets her original number, she is pretty sure that the two equations are inverses.

a. Is Adriena's strategy sufficient? Is there anything else she should test to be sure?

b. With your team, select a pair of inverse equations from problem 5-41, name them $f(x)$ and $g(x)$, then use Adriena's ideas to test them.



c. Adriena wants to find a shortcut to show her work. She knows that if she chooses her input for $f(x)$ to be 3, she can write the output as $f(3)$. Next, $f(3)$ becomes the input for $g(x)$, and her output is 3. Since $f(3)$ is the new input for $g(x)$, she thinks that she can write this process as $g(f(3)) = 3$. Does her idea make sense? Why or why not?

d. Her friend, Cemetra thinks she could also write $f(g(3))$. Is Cemetra correct? Why or why not.

e. Will this strategy for testing inverses work with any input? Choose a variable to use as an input to test with your team's functions, $f(x)$ and $g(x)$.

5-43. Statler, Adriena's teammate, is always looking for shortcuts. He thinks he has a way to adapt Adriena's strategy, but wants to check with his team before he tries it. *"If I use her strategy but instead of using a number, I skip a step and put the expression* $f(x)$ *directly into* $g(x)$ *to create* $g(f(x))$*, will I still be able to show that the equations are inverses?"*

a. What do you think about Statler's changes? What can you expect to get out?

b. Try Statler's idea on your team's equations, $f(x)$ and $g(x)$.

c. Describe your results.

d. Does Statler's strategy show that the two equations are inverses? How?

5-44. Trejo says that if you know the x-intercepts, y-intercepts, domain, and range of an equation then you automatically know the x-intercepts, y-intercepts, domain, and range for the inverse. Hilary disagrees. She says you know the intercepts but that is all you know for sure. Who is correct? Justify your answer.

Classwork Week 2

Staple together with:

Warm Up on top

5- #1---> 5 (own paper)

5- #16 ---> 18
(with resource pages)

5- #20 ---> 23

5- # 40 ---> 44

HW: 5-

48 ---> 54